Research Proposal Form of the Thesis Entitled

Prevalence of Different Types Of Malocclusion Among Patna Population

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INTRODUCTION

The need for orthodontic procedure is on the rise worldwide. It is crucial to strategize orthodontic procedure within a population to properly evaluate necessary resources for this particular service[1]. "A malocclusion is defined as an irregularity of the teeth or a malrelationship of the dental arches beyond the range of what is accepted as normal" (Walther et al., 1994). "Maloccluded teeth can cause psychosocial problems related to impaired dentofacial aesthetics" (Kenealy et al., 1989); "disturbances of oral function, such as mastication, swallowing, and speech" (Proffit and Fields, 2000); and greater susceptibility to trauma (Grimm et al., 2004)[2,3].

If a misalignment of the teeth is identified at a young age, preventive and corrective measures can mitigate the progression of the misalignment. It is imperative to evaluate the frequency of various types of malocclusion within a specific population in order to establish a basis for planning preventive and corrective orthodontic procedures. Recognizing malalignment as a significant issue in public dental health services for children necessitates the development of logical strategies for preventative and therapeutic orthodontic intervention. The occurrence of malocclusion varies among different countries, with rates of 87.5% in Colombia, 23-34% in the United States of America, and 23-49% in India[4].

In comparatively developed areas of world, orthodontics is well established with sufficient information available. However, this may not be the case in developing countries. Despite its limitations, Angle's classification is widely used to evaluate malocclusion as a qualitative epidemiological tool[5].

Numerous investigations has been undertaken to examine the occurrence of misalignment in various populations. It is imperative to do epidemiological investigations on misalignment across all areas and diverse geographical regions. India, recognized as the preeminent democracy worldwide due to its population exceeding one billion individuals, ranks second in terms of population after China and is also the seventh largest country in terms of land area. Due to its vastness and diversity, along with its substantial population, India experiences variations in demography, nutrition, culture, dietary patterns, ethnicities, and religious beliefs. The populace resides in diverse geographical regions, ranging from the mountainous landscapes of Himachal Pradesh to the arid deserts of Rajasthan, and from bustling metropolises such as Delhi and Mumbai to the remote tribal regions within the country[6,7].

The occurrence of misalignment of teeth, has been documented to reach a substantial 87% in the capital city of Delhi, while conversely, the southern city of Madras reports a comparatively lower prevalence of 16.6%[6]. Actual data on the occurrence of misalignment

and the necessity for orthodontic procedures is indispensable for any healthcare institution that offers orthodontic services to the affected individuals.

A study done by Soh et al. at the National University of Singapore presented findings on the incidence of malocclusion among Asian population. The investigation exposed that the prevailing condition was Class I malocclusion, with Class II and Class III as the subsequent conditions on both the left and right sides. The growing keen in early detection and treatment of misalignment has prompted the need for gathering data on adolescent patients, which would prove advantageous[8].

The occurrence of malalignment of the teeth exhibits differences across various nations and also within distinct racial groups. The incidence as reported in previous studies exhibits a wide spectrum, ranging from 37% to 94% which illustrates that a majority of child are having malocclusion. The rationale behind this extensive deviation might stem from disparities in ethnicities, discrepancies in the age range among the participants in various studies, and, most crucially, disparities in the registration methodology. The cause for this extensive divergence could potentially be attributed to variances in ethnic populations, disparities in sample's age across various studies, and notably, discrepancies in the method utilized for registration.

India is an expansive and progressive nation. The nation is diligently working towards resolving numerous health-related disorders. The findings from epidemiological investigations concerning malocclusion serve not only to assist in the formulation of orthodontic therapy plans but also to provide a logical methodology for ascertaining the etiology of malocclusions[9].

The epidemiological data about malocclusion for some of the states in India is available in the literature. But very few studies in regard to the frequency of malalignment in Bihar population have been reported. So, the main aim of this present study is to assess the frequency of malalignment and its distribution based on gender within the population of Patna.

STATEMENT OF PROBLEM

It has been observed that the frequency of malocclusion, especially Class I malocclusion is high in Patna population.

CLINICAL IMPLICATION OF THE STUDY

Prior research has demonstrated that it is necessary to know the frequency of various types of

malocclusion of the teeth and jaws within a specific group of individuals. The implication of this research will help the clinician to identify malocclusion early. Preventive and interceptive measures, when implemented, have the ability to mitigate the progression of a developing malocclusion.

AIM

- To evaluate the frequency of malocclusion and its distribution based on gender within the Patna's population.

OBJECTIVES

- To assess Class I malocclusion among Patna population.
- To assess Class II Division 1 malocclusion among Patna population.
- To assess Class II Division 2 malocclusion among Patna population.
- To assess Class III malocclusion among Patna population.
- To assess sexual dimorphism among Patna population.

HYPOTHESIS

Proposed Hypothesis

- There is high frequency of Angle's Class I malalignment (crowding, rotation, increased or decreased overjet, increased or decreased overbite, crossbite, diastema, proclination or retroclination) than Class II and Class III malocclusion among Patna population.
- There is high incidence of Angle's Class II Division 1 malocclusion than Angle's Class II Division 2 malocclusion among Patna population.
- There is low incidence of Angle's Class III malocclusion among Patna population.
- No sex difference between the different malocclusion among Patna population.

Null Hypothesis

- Class I malalignment is the most commonly found, while Class II Division 1 and Class II Division 2 follow suit, and Class III malalignment is the least frequently encountered.

REVIEW OF LITERATURE

Altemus LA (1959)[10] carried a comprehensive survey in four schools located in the district of Columbia with the aim of investigating the occurrence rate of malalignment among African American children aged twelve to sixteen years. 3289 children were examined in the public schools of district of Columbia. The inclusion criteria were presence of permanent dentition and had received no orthodontic treatment. The frequency of malocclusion incidence was evaluated through two distinct methods. A comparative analysis was done to examine the occurrence rates of malalignment in Negro and Caucasian children. The frequency of incidence of malalignment was found to be high in Negro child population. 83% of the children had malocclusion of their teeth. About 4% had ideal or nearly perfect malocclusion and 13% had normal occlusion. There exist disparities in the occurrence rate of different categories of misalignment of teeth, in relation to the Angle classification system among North American individuals of African descent and those of Caucasian origin. There were fewer Negro children with normal, class II Division 1 and class III malocclusion.

Silva RG, Kang DS (2001)[11] analysed the frequency of malalignment among adolescent Latino population. This study examines the occlusion characteristics of a cohort consisting of 507 Latino adolescents aged 12 to 18 years. It is noteworthy that over 93% of the sample displayed signs of malocclusion. Most of the patients who were part of this particular investigation were of Mexican or Mexican-American descent. Among the 507 individuals who were examined, 319 of them, accounting for 63% of the total, exhibited Class I malocclusion. In contrast, only 33 subjects, or 6.8%, displayed Class I normal occlusion. Class II malocclusion was detected in 119 individuals, representing 21.6% of the sample, with the majority of them, specifically 94.6%, having Class II Division 1 malocclusion. Additionally, the study identified 46 individuals, encompassing 9.1% of the participants, who had Class III malocclusion.

Thilander B, Pena L, Infante C, Parada SS, Mayorga CD (2001)[1] conducted a study that examined the incidence of misalignment and necessity for orthodontic intervention among children and young adults in Bogota, Colombia. This study focused on various phases of tooth development and aimed to evaluate the incidence of misalignment in Bogotanian child and young adults, taking into account the severity of the condition, as well as the individuals' sex and specific stages of dental development. The study sample was of 4724 children between 5-17 years, selected from the population attending the Dental Health Service. None of the participants had undergone orthodontic treatment. The findings indicated that 88 percent of the participants exhibited some form of anomaly, ranging from mild to severe. Among these anomalies, occlusal anomalies were recorded in half of the subjects, space discrepancies in one-

third, and dental anomalies in one-fifth. With the exception of overjet, spacing, tooth size, and crowding, there were no significant differences between the gender. A small necessity for orthodontic therapy was observed in 35 percent of individuals, while a moderate necessity was found in 30 percent. The calculation of an extensive requirement determined that it accounted for a proportion of 20 percent. On the other hand, an urgent requirement for therapy was estimated to be 3.5 percent.

Onyeaso CO (2004)[5] conducted a study to know the frequency of malalignment among predominantly Yoruba adolescents in Ibadan, Nigeria. Additionally, results were compared with different authors. This investigation constituted a survey comprising of 636 secondary school students, with 334 boys (52.5%) and 302 girls (47.5%); between the ages of 13 and 17. The subjects were selected randomly from five secondary schools in Ibadan, which were representative of the city's socioeconomic distribution. None of the students had undergone previous orthodontic treatment. The survey assessed the occlusal sagittal relationships using the Angle system. The results unveiled that approximately 29% of the subjects displayed mesio-occlusion, whereas 50% exhibited Class I malocclusions. 18% had disto-occlusion, and 17% had mesio-occlusion. The proportion of individuals with a normal overjet was 65%, while those with an increased overjet accounted for 16% and those with a decreased overjet accounted for 8%. It was determined that neutron-occlusion has the most prevalent occlusal pattern. Moreover, it is possible that different patterns of disto and mesio-occlusion may be present among individuals from northern and southwest Nigeria.

Mtaya M, Brudvik P, Astrom AN (2009)[2] conducted a study that revealed the incidence of misalignment and their correlation with socio-demographic factors, dental cavities, and oral health in Tanzanian school children between 12 to 14 years. 1601 children, with age of 13 years and 60.5 percent of them being girls, have taken part in the study. The results revealed that 63.9 percent exhibited one form of anomaly, and an open bite being the commonly observed abnormalities, with percentages of 22.8, 22.9 and 17.1 respectively. The vast majority, specifically 94.6 percent, of the child exhibited Angel's Class I. Class II and Class III Angel's malocclusions were identified in 5.4 and 2.8 percent of the subjects. School children who exhibit good or bad oral hygiene have shown a reduced probability, in comparison to their peers who possess good oral hygiene, of receiving a diagnosis for a midline shift. The results of the survey indicated that there is a requirement for proactive initiatives aimed at tackling the initiation of malocclusion

Gois EG, Vale MP, Paiva SM, Abreu MH, Serra-Negra JM, Pordeus IA (2012)[12] a research

investigation was undertaken out to ascertain the prevalence of malalignment between school-aged individuals throughout a span of five years. The hypothesis that individuals with previous malocclusion would have same features during the change from deciduous to mixed dentition was also verified. The study included school children aged 8 to 11 years. Individuals who had not undergone any orthodontic treatment or adenoidectomy were also eligible. The study found that malocclusion was most common in child with misalignment (94.4%) compared to those without misalignment (66.7%). 70.1% of cases demonstrated spontaneous correction of anterior open bite. The study concluded that malocclusion is common and individuals with prior anterior open bite, increased overjet, and crossbite are at higher risk of having these characteristics in transition dentition.

Siddegowda R, Satish RM (2014)[4] studied incidence of misalignment and sexual dimorphism between Indian school children in Karnataka. A study of the frequency of malalignment was undertaken across all 30 districts in Karnataka, India. The study specifically focused on school child; ages of 10 and 16. The final subject of 9508 individuals, selected from 108 schools throughout Karnataka. The system used to document malocclusion was the Ackermann-Proffit method. The result showed that frequency of crowding was 51.4% in boys and 52.4% in girls. Angle's Class I malocclusion had more prevalence with 76.4% of boys and 81.2% of girls. Angle's class II malalignment was present in 22.5% of boys and 18.8% of girls and class III malalignment was observed in only 0.3% of boys.

Dimberga L, Lennartssonb B, Arnrupc K, Bondemarkd L (2015)[13] conducted this longitudinal study of 10 years from 2003 till 2013. The objective of their research was to observe and assess a cohort of children from primary stage until they reached early permanent dentition. Additionally, they examined the potential influences of habits, breathing disturbances, and allergies on these factors. A total of 277 children were monitored. From this investigation, it was determined that malocclusions were evident in 73% of participants at 3 years, 58% at 7 years, and again 71% at 11.5 years. Approximately 22% exhibited a pronounced or extreme need for orthodontic treatment. Habits, allergies, or breathing disturbances detected at the age of 3 showed no correlation with malocclusions at the age of 11.5. The authors concluded that the sample population demonstrated a noteworthy proportion of malocclusions and demand for orthodontic treatment.

Agarwal SS, Jayan B, Chopra SS (2015)[6] did a systemic review comparing the frequency of malalignment in different states of India. The review emphasizes several epidemiological studies that focus on the frequency of malocclusion traits in various states of India. The

objective of the comparison was to know the range of epidemiological variations within the expansive nation of India. The incidence of Class II malalignment was significantly higher in Delhi and Haryana compared to Bangalore and Thiruvananthapuram. Moreover, the populace residing in the southern area demonstrates a predisposition towards bimaxillary protrusion based on ethnic factors. Furthermore, it is worth noting that the frequency and severity of misalignment are more pronounced in urban Indian populations as opposed to rural and tribal populations. A noticeable discrepancy in the occurrence of malocclusion among indigenous Indian children and metropolitan Indian children has been detected.

Singh SP, Kumar V, Narboo P (2015)[7] the frequency of malalignment in the population of child and adolescent in different schools of Leh was evaluated. The subject consisted of 691 school children and adolescents, including 310 boys and 381 girls, ranging from 11 to 19 years. The frequency of misalignment was determined by calculating the percentage of affected child. Notably, the increased frequency of malocclusion was observed for bite depths ranging from 26 to 50%. Additionally, the frequency of open bite, overjet and crossbite were also assessed, with rates of 1.6%, 52.2%, 8.7%, and 6.9%, respectively. Among these malocclusions, Angle's Class I was most prevalent, followed by Angle's Class II Division 1 and Class III malocclusion.

Gunatissa CN, Pathirage SL, Ratnayaka N (2016)[14] determined the frequency of malalignment in 15 year old students attending school in Sri Lanka. In total, 810 students were included in this inquiry. The data were analyzed using SPSS 17 for Windows. The occurrence of misalignment in the subject was 69.8%. The researchers concluded that implementing the IOTN extensively, along with conducting a comprehensive examination of occlusal characteristics, it is suitable for the allocation of resources for dental health in the community.

Alhammadi MS, Halboub E, Fayed MS, Labib A, El-Saaidi C (2018)[15] evaluated the worldwide spread of malocclusion attributes. 53 among 2,977 samples were taken. In the permanent dentition, the distribution rates of Class I, Class II, and Class III malocclusion were 74.9%, 19.6%, and 5.9%, respectively. As for the transition dentition, the distributions of these malalignment were 75%, 24%, and 6%. Caucasians exhibited the increased incidence of disto-occlusion in secondary dentition and transition dentition. Mesio-occlusion in transition dentition was greatly prevalent between Mongoloids.

Gudipaneni RK, Aldahmeshi RF, Patil SR, Alam MK (2018)[16] studied the prevalence of malocclusion and the need for orthodontic procedures among adolescents residing in Saudi Arabia. The occurrence of misalignment and need for orthodontic procedures in teenagers were

evaluated by the researchers. The research yielded findings indicating that the most prevalent malocclusions, in order of frequency, were Angle's Class I malocclusion at 53.8%, Angle's Class II malocclusion at 32.2%, Angle's Class III malocclusion at 16.5%. In terms of facial profiles in the sagittal plane, the most common were the straight facial profile at 49.2%, followed by convex at 42.6% and concave at 8.2%.

Sunil NS, Ganapathy D, Visalakshi RM (2019)[8] a study was conducted to investigate the occurrence of misalignment between 13-17 years in Malaysia. Total of 100 school children, both boys and girls were selected to undergo a dental examination. The findings revealed that approximately 94% of the population exhibited malocclusion, with 82% classified as Class I, 9% as Class II, and 13% as Class III malocclusion. The prevalence of crowding was observed to be 70%, with an increased prevalence of Malays (77.6%). Subjects exhibited normal overjet in 44% of cases, while overbite was seen in 50% of cases. The researchers concluded that Class II malocclusion was more prevalent in Indians, whereas Class III was predominantly observed in Malays and Chinese. Malays exhibited highest number of crossbites compared to Indians and Chinese.

Lombardo G, Pagano S, Cianetti S, Capobianco B, Orso M, Negri P, Paglia M, Friuli S, Paglia L, Gatto R, Severino M. (2020)[17] a study was done to examine occurrence of malocclusion at different stages of dentition. Researchers gathered data from orthodontic textbooks and analyzed a total of 77 studies after reviewing 450 records and 284 relevant publications. The prevalence of malocclusion worldwide was found to be 56%, with no significant differences between genders. The prevalence score of malocclusion remained constant at 54% when comparing primary dentition to permanent dentition. Various malocclusion traits, including Angle's classes, overjet, overbite, and asymmetrical midline shift, exhibited consistent prevalence rates across different dentitions. The researchers reached a conclusion that the global occurrence of malocclusion and its occurrence at an early age in childhood require the active participation of policy makers, pediatric physicians, and dentists in the creation of preventive measures and clinical methods to tackle malocclusion in younger children.

Avinash B, Balasubramanian S, Ravikumar M, Shekar S, Avinash BS (2020)[9] a cross-sectional observational study was conducted to assess various forms of malocclusion through the utilization of the IOTN Index and Geographic Information System. The primary objective was to know the grades of misalignment in school-going children age 12 years in the district of Mysuru; total sample were 840 subjects. GIS mapping, utilizing the Arc GIS software, was

employed to analyze and visualize the prevalence and frequency of different malocclusions. According to the IOTN classification, it was observed that among the 409 male participants, 121 individuals (29.6%) had a definite requirement for orthodontic procedures. Furthermore, the incidence of misalignment was determined to be 58.2%, with displacement being the most prevalent type of malocclusion observed.

METHODOLOGY

Data collection

Patients exhibiting Angle's Class I, Class II Division 1, Class II Division 2, and Class III malocclusion shall be selected for inclusion in this study. Only those individuals who have provided their consent to participate shall be enrolled.

Based on inclusion and exclusion criteria, patients will be chosen.

Inclusion criteria:

1) Age between 16 to 26 years,
2) Permanent dentition with no presence of primary teeth
3) All permanent first molars should be present
4) No missing teeth,
5) No previous history of orthodontic treatment.

Exclusion criteria:

1) Individual with syndromes or developmental disorders
2) Facial asymmetry, and
3) Medically compromised individual.

During the course of each examination, the individual in question will be positioned in a dental chair. A comprehensive clinical examination will be conducted, utilizing a mouth mirror and light to assess various aspects such as the molar relationship in the anteroposterior dimension, crowding, overjet, overbite, crossbite, and the presence of a midline diastema. All occlusal relations will be assessed at a centric location, which will be attained by instructing the participants to perform a swallowing action while bringing their teeth into contact. A qualitative evaluation employing Angle's classification will be employed to depict the front-to-back relationship between the upper and lower first molars during the state of maximum intercuspation.

The occlusion will then be classified on the basis of the relationship of the first permanent molar as described by Angle into normal occlusion and malocclusion (Class I, Class II Division 1, Class II Divison 2 and Class III). Subjects with Class I molar relation with minimal overjet

and overbite, and very minimal crowding with proper alignment will be classified as normal. Subjects showing Class I molar occlusion with crowding, overjet, overbite, crossbite, and midline diastema will be classified as Class I malocclusion. Method of registration is shown in Table 1.

Table 1: Method of malocclusion registration

Malocclusions	**Method of registration**
Sagittal occlusion	Angle's classification
Crowding	If one tooth overlaps with respect to other teeth
Overjet	Excessive when more than 3 mm, reduced when <2 mm
Overbite	Excessive when more than 2 mm, reduced when <2 mm
Midline diastema	Space present between central incisors is more than 1 mm
Crossbite	Present if one or more upper teeth are placed palatally or lingually to lower teeth

Data analysis

To assess the mean values across different intervals, a paired-sample t-test will be employed. The disparity in mean values between genders will be evaluated through an independent-sample t-test. The data will be analyzed using (SPSS v16; SPSSInc), based in Chicago, IL, USA.

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